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Case Study

POCUS: A Valuable Tool in Differentiating Lung Pathology

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Abstract

The emergency department of Malaysia has been greatly affected by overcrowding, longer waiting times, and longer admission times ever since the world was hit by the COVID-19 pandemic. Thus, it is essential for the emergency department to obtain an accurate diagnosis early and provide earlier treatment for better outcomes for patients. The use of bedside lung ultrasound is useful in these scenarios in differentiating different causes of respiratory symptoms, and further management and definite treatment can be provided accordingly.

Keywords:- Lung Pathology, Respiratory Symptoms, COVID-19

Introduction

Ultrasonography has been widely used since the early 1900s, initially created for the detection of icebergs by Paul Langevin, 1920s used for whale detection by fishermen, 1930s for the manufacturing of metals and tires in the industries. In the 1940s, Andre Denier, the father of medical ultrasound, introduced the usage of ultrasound in clinical settings in his work, la Presse Medicale in 1946. From then onwards, the usage of ultrasound has gained great stride in medicine, especially in the 1950s when it was used in obstetrics and cardiology. However, no further progression of ultrasound was used in the medical field other than viewing gallstones ever since the introduction of Computed Tomography (CT) in the 1980s (Lichtenstein, 2016).

Until Daniel A. Lichtenstein, the pioneer of critical care ultrasound, came along in 1985, with the relentless effort from him and his team over 10 years, they were able to establish a holistic lung ultrasound approach for critically ill patients. Since then, more and more successful evolutions of lung ultrasound for the critically ill (LUCI) were made. Subsequently, the bedside lung ultrasound in emergency (BLUE) protocol was born in 2008 after acknowledging the diagnostic accuracy of lung ultrasound (after comparing it with the CT – which was deemed as the gold standard).

The COVID-19 pandemic has made the diagnosis of lung pathology longer as patients have to wait an average of 13-14 hours in the emergency for the Covid test results and admission. (Singh & Rahman, 2021). Thus, the use of Point of care ultrasound (POCUS) can be useful in the setting of the emergency department in helping to approach patients with undifferentiated diagnosis (Harun, Kamisan & Singh, 2022 & Singh, 2022), which in this case differentiates a massive pleural effusion from pneumonia.

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Case Presentation

Patient Mr M, 81 years old retired firefighter, with a body mass index of 24kg/m2, known case of hypertension, diabetes mellitus, dyslipidemia, and chronic kidney disease presented to the emergency department (ED) with a history of productive cough for 1 month, worse at night and unquantifiable weight loss. Otherwise, the patient denied a history of fever, travel history, smoking history, or sick contact. He had visited multiple general practitioners over 1 month but there was no relief in symptoms.

Upon arrival in ED, the patient was afebrile (temperature 36.8 °C, tachypnoea with respiratory rate of 24 breaths per min and SPO2 91-93% under room air. Arterial blood gas taken under room air showed type 1 respiratory failure: pH 7.47, PO2 66, PCO2 29, HCO3 21.1 and Mr M was started on an oxygen supplement of five liters per min via face mask. Chest x-ray (CXR) showed patchy consolidation over bilateral lungs, worse over the left side.

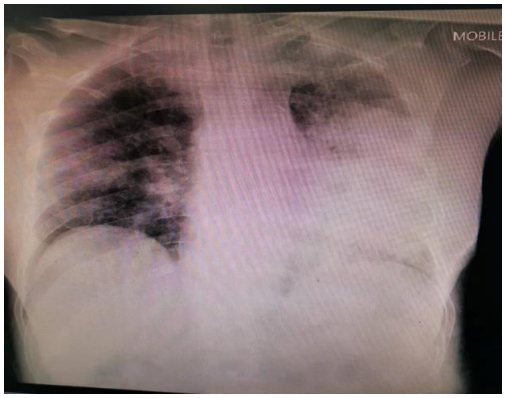

Figure 1: Chest X-ray of Mr. A

A bedside lung sonography was done which shows shred sign and hepatisation of lungs with no evidence of pleural effusion.

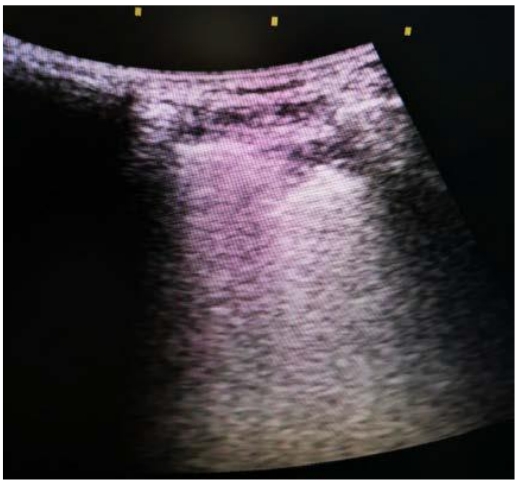

Figure 2: Shred Sign (White Arrow)

Figure 3: Hepatisation of lung (white arrow), Spleen (red arrow)

Mr M was started on intravenous amoxicillin 1g–clavulanate 200mg and tablet azithromycin and was admitted to the general medical ward after COVID-19 PCR test was negative for further work up of pneumonia to rule out pulmonary tuberculosis.

Discussion

Complete or near complete opacification of lung fields is not an uncommon finding in the chest x-ray of a critically ill patient. However, there are several differential diagnoses such as pleural effusion, consolidation or atelectasis that may be the cause and each of them requires a different management. Thus, it is important for clinicians to be able to identify each of them as early as possible and provide earlier treatment for better recovery for the patient.

In such cases, usually a computed tomography (CT) scan would be the choice of imaging used for further evaluation however it may not be feasible for each patient as some may be too ill to transport to the CT suite. Thus, bedside lung sonography comes in as a reliable choice of investigation as it is usually available in the emergency department or Intensive care unit (ICU) and it is a reliable tool provided it is in good hands.

The usage of lung ultrasound in helping clinicians to make a rapid diagnosis in patients with acute respiratory failure has been well established since the introduction of BLUE protocol, with a well organised flow chart in helping clinicians to obtain a diagnosis with lung ultrasound as per image 1. The accuracy of lung ultrasound finding in comparison with CT scan is as high as 90.5 % overall. Each lung diagnosis comes with certain findings, for example in COPD or asthma, there would be predominant A lines plus lung sliding with 89% sensitivity and 97% specificity, in cases of pulmonary edema, it would shown multiple anterior diffuse B lines with lung sliding with 97% sensitivity and 95% specificity, in cases of pulmonary embolism, lung ultrasound would show normal anterior profile plus deep venous thrombosis with 81% sensitivity and 99% specificity. In cases of pneumothorax, lung ultrasound would show absence of lung sliding anteriorly plus A lines plus lung point with 81% sensitivity and 100% specificity. As for pneumonia. Lung ultrasound would show anterior alveolar consolidations, anterior diffuse B lines with abolished lung sliding, anterior asymmetric interstitial patterns, posterior consolidations or effusions without anterior diffuse B lines with 89% sensitivity and 94% specificity (Lichtenstein & Meziere, 2008).

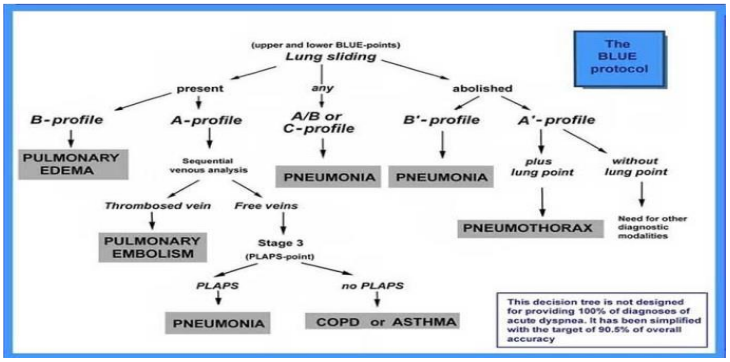

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Figure 4: The Blue Protocol

Conclusion

The bedside lung ultrasound is a safe and reliable tool in helping clinicians to achieve a diagnosis more rapidly and be able to provide earlier treatment in order to improve the outcome of patients.

Conflict of Interest

The authors declare that they have no competing interests.

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